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BUREAU OF ANIMAL INDUSTRY.—CIRCULAR 118.

A. D. MELVIN, CHIEF OF BUREAU.

THE UNSUSPECTED BUT DANGEROUSLY TUBERCULOUS COW.

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BY

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LETTER OF TRANSMITTAL.

U. S. Department of Agriculture,
Bureau of Animal Industry,
Washington, D. C., November 6, 1907.

Sir: I have the honor to transmit herewith for publication in the circular series of this Bureau a manuscript entitled "The Unsuspected but Dangerously Tuberculous Cow," by Dr. E. C. Schroeder, superintendent of the Experiment Station of this Bureau.

Experimental work in connection with tuberculosis has been carried on by Doctor Schroeder and other scientists of the Bureau at the Experiment Station for a number of years. A recent publication of this Bureau by the same author (Bulletin 99) showed how the environment of tuberculous cattle is permeated with tubercle bacilli, which are often discharged in enormous numbers in the feces, and how easy it is for the milk to become infected. The present article deals especially with cows that have been proved to be tuberculous to a dangerous degree, but whose physical appearance, as shown by illustrations, is fully equal to that of the average dairy cow and gives no indication of disease.

This work clearly demonstrates the danger to public health so long as cows which react to the tuberculin test are allowed to furnish milk or butter for public consumption.

Respectfully,

A. D. Melvin,
Chief of Bureau.

Hon. James Wilson,
Secretary of Agriculture.

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THE UNSUSPECTED BUT DANGEROUSLY TUBERCULOUS COW.

INTRODUCTION.

Tuberculosis is ordinarily a chronic, slowly progressive disease; consequently some time passes in most instances after a cow becomes affected before she begins to expel and scatter tubercle bacilli in a way dangerous to the health of other animals and persons. Precisely how much time thus passes can not be determined with certainty, as it varies greatly with different animals and is dependent upon individual peculiarities, the location of the disease in the body, the virulence of the infecting bacilli, and a number of unknown conditions. Practical experience indicates that the interval between infection and the dangerous expulsion and dissemination of tubercle bacilli is, with rare exceptions, sufficiently long for a herd to be kept entirely free from dangerously tuberculous animals, provided the tuberculin test is applied not less than once yearly and all reacting animals are segregated and no animal is added until it has passed the test.

The tuberculin test for tuberculosis is almost universally accepted by veterinarians as a nearly infallible means of diagnosis, but it gives no satisfactory information about the extent to which reacting animals are affected. Microscopic examinations and inoculation tests of the secretions and discharges from a tuberculous animal often prove that it is actively expelling and scattering tubercle bacilli, and is therefore positively dangerous; but the contrary, that a tuberculous animal has not reached a dangerous stage, can not be absolutely determined. For this reason, although we know that all cases of tuberculosis diagnosed with the aid of tuberculin are not at the time necessarily dangerous, and that some may not be dangerous until many months have passed, we are forced to assume for practical purposes that every tuberculous cow is dangerous from the moment she is known to be affected. We know that if she is not immediately dangerous she will rarely fail to become so, first intermittently, expelling tubercle bacilli occasionally, and then continuously, expelling and scattering them all the time in increasing numbers. Hence it should be clearly understood that the present state of our knowledge forces us to regard every tuberculous cow as dangerous and that no distinction for practical application can be made between dangerously and not dangerously tuberculous cows.

WHAT IS A DANGEROUSLY TUBERCULOUS COW?

If we use the term "dangerously tuberculous" in the restricted sense, the following practical, important questions may be asked: What is a dangerously tuberculous cow? What is her appearance? How does she act and what symptoms of disease does she show? What percentage of tuberculous cows in our dairy herds is dangerously tuberculous?

The first question has already been answered. The dangerously tuberculous cow from the provisional point of view is an animal that is expelling tubercle bacilli from her body, either with her milk, urine, feces, saliva, or otherwise, in such numbers and with such frequency that their presence can be certainly detected.

The examinations made at the Experiment Station show that the commonest way in which tubercle bacilli pass from the body of a tuberculous cow is with her feces. Every case of tuberculosis examined that was found to be expelling tubercle bacilli in any way showed them in the feces, and they were found in the feces many times when they could not elsewhere be detected. From this it is reasonable to conclude that the greatest danger from tuberculous cows lies in the infectious character of the material that passes from their bowels. The significance of this fact is apparent when it is viewed in conjunction with the following paragraphs quoted from a bulletin recently published by the United States Public Health and Marine-Hospital Service:[a]

> In addition to being old and warm, much of the milk sold in Washington is dirty. Fifty-one of the 172 samples examined showed no visible deposit in the original container after several hours standing. Fifteen of the samples contained a very small amount of dirt, 98 contained a small amount of dirt, 8 contained much dirt, and 1 contained (mouse?) feces.
>
> This foreign matter (dirt) when examined under the microscope was found to consist of fecal matter, hair, epithelial and other cells, straw, bacteria, and all manner of extraneous substances that have no place in clean milk.

After several hours standing in the original containers 121 of 172 samples, or 70 per cent of the kind of milk that reaches the city consumer, showed a visible deposit of dirt, which was found on microscopic examination to be made up in part of fecal matter. This dirt is characterized in the report of the United States Public Health and Marine-Hospital Service as "fully as undesirable as pathogenic or disease-producing germs are dangerous." To this should be added that we are now in a position to say that the presence of cow feces in milk, entirely apart from the impression it may make on the taste and appetite of the consumer, is prima facie evidence that the milk, when it is obtained from a tuberculous dairy herd, contains pathogenic bacteria. We will later return to this subject.

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[a] Hygienic Laboratory, Bulletin 35, p. 71.

PHYSICAL APPEARANCE OF DANGEROUSLY TUBERCULOUS COWS.

The second and third questions may be answered together. The dangerously tuberculous cow, long after she has become dangerous, may continue to look and act like a healthy animal. She may show neither symptoms of disease nor discomfort; her appetite may be good, and she may conceive, calve, and milk like an ordinary cow. Sometimes, not always, if we except long-standing cases of tuberculosis, she has a slight, infrequent, easily overlooked cough. If she is a member of a herd in which the other animals are thin, then, too, she is thin; on the other hand, if she is a member of a sleek, fat herd, she may be the sleekest and fattest of the lot. As a rule it is no exag-

FIG. 1.—Cow No. 1, apparently in excellent health, but affected with tuberculosis for more than six years; many tubercle bacilli found in feces.

geration to say that visibly tuberculous cows have very probably been dangerously tuberculous for several years.

To illustrate more effectually the appearance of the dangerously tuberculous cow, the photographs of seven are given, of which it is definitely known that they are expelling tubercle bacilli. Six of the seven cows were removed directly from dairy herds and their milk was being regularly distributed to customers in Washington, D. C. Cow No. 509, undoubtedly the most dangerous among them, is a quiet little animal with many points to recommend her for private family service.

Cow No. 1 has been affected with tuberculosis more than six years. Microscopic examinations show that she is constantly passing tubercle bacilli with her feces. The inoculation of guinea pigs with her feces,

also with milk slightly soiled with her feces, and with butter made from milk slightly soiled with her feces, caused them to become affected with typical generalized tuberculosis. The cow has been in the possession of the Bureau Experiment Station since June, 1895, and is now fully 18 years old. Her health is apparently excellent and her appetite good; she has no cough that would attract the attention of the casual observer. Even if she were not affected with tuberculosis, her present condition, as shown by the picture, would have to be regarded as very good for an animal of her age.[a]

FIG. 2.—Cow No. 509, in good condition and showing no symptoms of disease, recently in a herd supplying milk to Washington; tubercle bacilli present in both milk and feces.

Cow No. 509 was tested with tuberculin in a dairy herd and found to be tuberculous about nine months ago. Directly after her removal from the herd, which was supplying milk to Washington, D. C., microscopic examinations showed the presence of tubercle bacilli in both her milk and feces. In one quarter of her udder a small nodule about the size of a pea was found, the tuberculous character of which was not suspected until after she reached the Bureau Experiment Station. Guinea pigs inoculated with her milk and with butter made

[a] Since the above was written cow No. 1 died very suddenly. When she was stabled for the night she appeared to be in her usual condition and ate the whole of her evening feed; the next morning she was found dead. The post-mortem examination showed lesions of generalized advanced tuberculosis.

from her milk died affected with typical generalized tuberculosis. The butter made from her milk was ordinary salted butter, and in this the infection persisted with undiminished virulence for forty-nine days. Tests are being made to determine how much longer than the time named tubercle bacilli will retain their virulence in ordinary salted butter.

The cow is seemingly in better physical condition than most dairy cows. Her appetite is good, she has no cough, and shows no symptoms of disease or distress.

She calved about six months before the picture was taken. Her calf remained with her until it was weaned; it was killed at the

FIG. 3.—Cow No. 512, in good condition and showing no symptoms of disease; recently in a herd supplying milk to Washington; was scattering tubercle bacilli in a dangerous way.

age of five months and found on post-mortem examination to be affected with generalized tuberculosis. Four other calves, born of healthy cows, were also fed the milk of cow No. 509. One calf was fed one day, one three days, one seven days, and one thirty days. The calves fed respectively one, three, and seven days sucked the milk directly from the cow's udder, but were not allowed to be near her or to come in contact with tuberculous infection except at the time of feeding. The calf that was fed thirty days received the milk in a pail, and was never near tuberculous infection other than that contained in the milk. All four calves contracted tuberculosis.

Cow No. 512 was tested with tuberculin in a dairy herd and found to be tuberculous eight months ago. Directly after her removal from

the herd, which was supplying milk to Washington, D. C., microscopic examinations showed that she was passing tubercle bacilli with her feces. Her general condition is good, she has an excellent appetite, does not cough, and does not show a single symptom of tuberculosis or other disease. Without a tuberculin test her tuberculous condition would not be suspected, and without the microscopic test of her feces it would not be known that she is scattering tubercle bacilli in a dangerous way. She calved about three and one-half months before the picture was taken.

The record of cow No. 518 is identical with that of No. 512 with

FIG. 4.—Cow No. 518, recently found affected with tuberculosis in a herd supplying milk to Washington; apparently healthy, but actually scattering tubercle bacilli.

the exception that the tuberculin test which first demonstrated her tuberculous character was made one month later, and it is not known when she produced her last calf.

The record of cow No. 537 is identical with that of No. 512 excepting that the tuberculin test which first demonstrated her tuberculous character was made four months later, and it is not known when she produced her last calf.

Cow No. 552 was tested with tuberculin in a dairy herd about four months ago and found to be affected with tuberculosis. Directly after her removal from the herd, which was supplying milk to Washington, D. C., microscopic examinations showed that she was

passing tubercle bacilli with her feces. Subcutaneous inoculation of guinea pigs with her feces caused them to become affected with typical generalized tuberculosis. It is not known when she produced her last calf.

The significance of the inoculation of guinea pigs with her feces must be judged in connection with the fact that the amount of feces inoculated into each guinea pig is only a fraction of a grain. A cow of average size passes about 30 pounds of feces each day, and the small amount inoculated into a guinea pig to test for the presence of tubercle bacilli contains many other bacteria, some of which,

FIG. 5.—Cow No. 537, recently condemned as tuberculous in a herd supplying milk to Washington; though apparently in good health, she was passing tubercle bacilli.

when injected under the skin, cause inflammatory processes that prevent the actual entrance of tubercle bacilli into the tissues in a way to cause their absorption and the production of tuberculosis.

The cows shown in the illustrations, relative to breed and visible condition, are fairly representative of those usually seen in the better class of dairy herds from which the milk supply of cities is derived. Few better and many much worse looking cows are found in urban and suburban herds. The simple fact that a cow is thin does not condemn her. Dairy cows are not fat animals. Before her milk flow begins a cow is subjected to the drain that accompanies the production and delivery of a calf, and afterwards the feed she

eats is converted into milk rather than deposited in her body as fat. Cows that lay on much fat while they are milking are rarely economical for dairy purposes.

In addition to cow No. 1, another old cow remained under observation at the Experiment Station a long time. She died last spring after she had reached the age of 21 years. Before her death it was established that she was scattering tubercle bacilli both through the mouth and through the rectum, and pure cultures of these germs, isolated from the tuberculous lesions of guinea pigs inoculated with saliva and feces are now growing in the Pathological Division of the Bureau of Animal Industry. The tuberculous condition of the

FIG. 6.—Cow No. 552, found in a herd whose milk was sold in Washington; apparently healthy, but in fact dangerously tuberculous.

old cow was known six years before she died, but, notwithstanding her great age, she retained the semblance of health up to the last year of her life, during which she failed rapidly, became very thin, and suffered with a severe cough.

To the six pictures previously given one more of a dangerously tuberculous cow is added. This last picture is presented to show that a dangerously tuberculous cow may actually be in prime, fat, beef condition.

This cow (No. 551) was tested with tuberculin in a dairy herd about four months before her picture was taken, and was found to be affected with tuberculosis. Microscopic examinations show that

she is passing tubercle bacilli with her feces. She is entirely too fat to be regarded as a good dairy cow and shows no symptoms of disease or distress. A fairly large number among tuberculous cows of equally fine appearance examined post-mortem at the Experiment Station have been found to be affected with advanced and more or less generalized tuberculosis.

PERCENTAGE OF DANGEROUS COWS IN DAIRY HERDS.

We now come to the fourth question, which concerns the percentage of cows in dairy herds that are dangerously tuberculous among those found to be affected with tuberculosis through the application of the

FIG. 7.—Cow No. 551, too fat for dairy purposes, and appearing to be perfectly healthy; found recently in a herd supplying milk to Washington; tubercle bacilli found in feces.

tuberculin test. It must be borne in mind constantly that the term "dangerously tuberculous" is used only for the sake of convenience to designate those cows of which it can be shown beyond doubt that they are disseminating tubercle bacilli, not actually to separate the dangerously from the not dangerously tuberculous, which is impossible.

The number of cows examined to obtain an answer to the fourth question was not large; there were 24 which were removed directly from dairy herds, and 6 others which were known to have been affected with tuberculosis three years or more. Among the former,

10, or a trifle over 40 per cent, were found to be expelling tubercle bacilli, and among the latter all were expelling them. Examinations of the same kind will be continued, and a report will probably be published later, when the results in a larger number of cases can be given.

The cows removed from dairy herds, notwithstanding their tuberculous condition, had the general appearance of ordinary dairy cows, and those regarding which it could be demonstrated that they were expelling tubercle bacilli appeared to be and acted fully as well as those regarding which this could not be demonstrated. Among the 24 cows, 12 were specially selected for another investigation, because a careful physical inspection indicated that they were in the early stages of the disease. From this we may conclude that the examination of a larger number of tuberculous dairy cows will tend to increase rather than reduce the percentage of those which are without doubt expelling tubercle bacilli, though it must be admitted that the physical inspection of tuberculous cows gives no reliable or satisfactory information about their condition, unless they are so badly diseased that no conscientious dairyman would continue to sell their milk.

From the 6 cows known to have been affected with tuberculosis for three years or longer, all of which were passing tubercle bacilli in a manner capable of actual proof, we may justly conclude that with possibly rare exceptions all tuberculous cows eventually become dangerous and it is merely a question of time after a cow has contracted tuberculosis when she will begin to scatter tubercle bacilli.

The prevalence of tuberculosis among dairy cows has been estimated at all the way from 10 per cent to 90 per cent. The one figure is certainly too low and the other too high. There are many herds that have never been tuberculous, some that have been cleaned of tuberculosis, and others in which every cow is affected. The best evidence we have of the common presence of tuberculosis among dairy cows is the claim made by some dairymen that a milk famine would result from the condemnation of all tuberculous cows for dairy purposes. The dairymen who make this claim evidently know what they are talking about, and though we may assume that they make it rather with the intention to oppose a feared general application of the tuberculin test to dairy herds than to call attention to an extremely dangerous and objectionable condition, the claim is in truth a strong argument to prove how urgently vigorous action is needed to clean dairy herds of diseased animals.

DANGER FROM INFECTED MILK AND BUTTER.

We must now return to the significance of a sediment in milk. We have seen from the work of the United States Public Health and

Marine-Hospital Service that among 172 samples of city milk examined 121, or 70 per cent, contained a sediment after standing a few hours in the original containers, and that the sediment consisted in part of cow feces. Tuberculosis is so common among dairy cattle that milk producers frequently assert, as before stated, that a milk famine would be one of the results if the tuberculin test were applied to all dairy cattle and if all those reacting were condemned for dairy purposes. We know that it can be definitely shown that about 40 per cent of all cows that react to the tuberculin test, though they still retain the appearance of health, are actively passing tubercle bacilli. We know that the commonest mode for tubercle bacilli to be expelled from the body of a tuberculous cow is with her feces. And we know that it has been demonstrated that the bacilli contained in the feces of tuberculous cows are alive and virulent. Add to this the two facts that butter made from milk soiled with the feces of cow No. 1 produced tuberculosis on the inoculation of guinea pigs and that the tuberculous infection contained in the butter made from the milk of cow No. 509 showed no diminution of virulence after forty-nine days, and it is hardly necessary to formulate the conclusion that tuberculosis among dairy cows is one of the greatest dangers to which public health is exposed, and that every effort should be made by those who have the welfare of humanity at heart to correct this great evil.

Doctors Herr and Beninde,[a] two German investigators, concluded from their work that skim milk, buttermilk, cream, butter, and centrifuge slime or sediment obtained from infected milk contained tubercle bacilli, and that the most intensely infected of these substances are butter and centrifuge slime. Among 444 samples of butter tested by them and other investigators, 60, or over 13 per cent, were found to contain tubercle bacilli. Broërs[b] of Utrecht places the frequency with which the milk of his country contains tubercle bacilli at 10 per cent, and shows that they may be present in skim milk, cream, buttermilk, and butter and retain their virulence a long time. Brittlebank[c] of England reports that the milk supplied to the city of Manchester, obtained from different counties, showed from 3 per cent to 12 per cent of the samples examined to be infected with tubercle bacilli. Dr. Albin Burkhardt,[d] after the examination of 1,452 human cadavers, found that 91 per cent showed lesions of tuberculosis irrespective of the cause of death. Nägeli, from the examination of 500 cadavers, places the figure at 96 per cent, and Schlenker, from 100, makes it 66 per cent. Other

[a] Zeitschrift für Hygiene, etc., Vol. 38, p. 180.

[b] Zeitschrift für Tuberkulose, etc., Vol. X, No. 3.

[c] Experiment Station Record, Department of Agriculture, Vol. XVIII, p. 581.

[d] Zeitschrift für Hygiene, etc., Vol. 53, No. 1.

investigators have added the weight of their testimony to substantiate this amazing frequency with which persons are shown to be affected with tuberculosis. These autopsy revelations indicate that few human beings entirely escape tuberculosis, though the majority die of other diseases and many are not conscious during their lives that they are affected. This is just what we should expect when we know that tubercle bacilli, concealed in butter, milk, cream, and other dairy products, are systematically and regularly distributed in a way that insures their ingestion by persons wherever the sale of milk from tuberculous cows is permitted.

If the public were thoroughly informed of the dangers, among which tuberculosis is only one of many, to which it is exposed through the use of impure, dirty, and infected milk, the demand for milk of approved purity would rise to the magnitude of a concerted national movement and would sweep all objections and difficulties out of its way. Inform a man that a single one among many loaves of bread—you do not know which—is contaminated with arsenic, strychnin or some other commonly dreaded poison, and he will go very hungry before he risks eating any loaf of the lot. He knows what arsenic and strychnin are and what he must expect from their introduction into his stomach. Yet he continues to use milk and dairy products, and permits his family to use them, without first testing their purity or insisting that the doubt about their purity shall be removed, notwithstanding that they have repeatedly been shown to contain poisons fully as objectionable and potent as those above named, such as the germs of tuberculosis, typhoid fever, scarlet fever, diphtheria, and other diseases, and the poisons that are the cause for the high death rate from abdominal diseases among children who have not passed the milk-drinking period of life.

THE GREAT IMPORTANCE OF A PURE MILK SUPPLY.

There is an important moral side to the milk question which must not be ignored. We may have the right—a very doubtful right, to be exact—to neglect the dangers to which we, as adults capable of judging and acting for ourselves, are exposed; but we have absolutely no right to neglect the conditions that cause suffering and death among children. The failure to act and to act quickly and unceasingly until a safe milk for children, at least, is within easy reach of every mother, may be characterized as barbarous, if not criminal, indifference. It is an offense against the innocent, unquestioning confidence which children repose in their adult friends.

Under our present conditions of civilization the importance of milk is second only to that of air and water. Without milk thousands of children who grow to useful maturity would starve before they completed the first year of their lives. The excellent work done

by Dr. George W. Goler, of Rochester, N. Y., proved beyond doubt that thousands of lives are annually lost through the use of impure milk. The reform his praiseworthy and untiring energy brought about in Rochester, by no means a very large city, reduced the mortality among children under 5 years from 7,451 for the ten years ending in 1896 to 4,965 for the ten years ending in 1906. This shows a saving of 2,486 lives, among which 1,554, or 62.5 per cent, were children under 1 year old, that is, had not passed the period of life during which milk forms the most important element of their daily food.

What can be done by substituting a pure milk supply for an impure one is shown by the following quotation from the New York Medical Record's London letter of July 26, 1907.[a]

> At Leeds a voluntary society established a year ago a depot for supplying a pure milk, as the corporation had no power to do so. But the health officer has made a report on the working. He concludes that, making allowance for the mortality for the first week of life and for those born moribund, there has been a saving of life of 25 per cent among the children using the society's milk as compared with those living in the same district at the same ages and during the same seasons fed otherwise. The experiment was on a small scale, but as far as it went was more successful than he could have anticipated.

The dairyman is not alone to blame for impure milk. As a rule, he attempts to supply a pure milk to his customers and is not conscious of the impurities and infections in the article he is distributing. The price he receives is too low for the production of a constantly pure milk. He should be better paid. If the money that now goes to druggists, doctors, undertakers, and burial grounds directly through the use of impure and unwholesome milk could be diverted to the dairyman, he would be amply paid for producing a wholesome, safe milk, and the entire community would profit by having better health, fewer deaths, and less suffering.

CONCLUSIONS.

1. The dangerously tuberculous cow is an animal that may long retain the appearance and general semblance of perfect health.

2. The methods we now have to detect the presence of tubercle bacilli in the secretions and discharges from tuberculous cows are too crude to give positive results unless the bacilli are quite numerous; hence, while we can frequently obtain direct evidence that a tuberculous cow is dangerous, the failure to obtain such evidence does not prove that a tuberculous cow is safe.

3. Among tuberculous dairy cows that retain the appearance of health and are not known to be affected until they are tested with tu-

[a] New York Medical Record, August 17, 1907, p. 275.

berculin, 40 per cent or more actively expel tubercle bacilli from their bodies in a way dangerous to the health of other animals and persons.

4. Dairy cows that have been affected with tuberculosis three years or more, with possibly rare exceptions, are active agents for the dissemination of tubercle bacilli.

5. The general evidence justifies the conclusion that tuberculous cows do not expel tubercle bacilli until some time after they contract the affection. The practical importance of this is that it enables us to clean herds of tuberculous cattle by the periodic application of the tuberculin test and the segregation of all reacting animals.

6. The interval of time that elapses between infection with tuberculosis and the dangerous expulsion of tubercle bacilli can not serve as a reason for retaining a tuberculous cow in a dairy herd after the fact that she is tuberculous has been determined. The duration of the interval after infection, before the expulsion of bacilli begins, varies greatly with different animals, and it is rarely possible to ascertain how long a cow has been affected when her tuberculous condition is first discovered.

7. From the present as well as from former[a] investigations we know that the commonest way for tubercle bacilli to pass from the bodies of tuberculous cows is with their feces. This fact, together with the common presence of tuberculosis among dairy cows and the frequency with which cow feces are found in the milk that reaches the consumer, is clear evidence that a considerable proportion of our dairy products are infected with tubercle bacilli.

8. The danger from the presence of tuberculosis among dairy cows is not confined to the use of milk as a beverage. When tubercle bacilli are present in milk they enter the various articles of diet prepared from it, and are specially numerous in butter, in which they may remain alive seven weeks or longer without showing a diminution of virulence.

9. The distribution of tubercle bacilli from tuberculous cattle in a way to endanger human health is not left to chance. It is a commercial, systematic distribution, from door to door, or rather from table to table. As long as the use of tuberculous dairy cows is permitted the manner in which dairy products are distributed will insure that practically every member of the human family is exposed to tuberculosis. This may explain why three European investigators from their post-mortem examinations of respectively 1,452, 500, and 100 bodies of persons who died from various causes found that, among this total of 2,052 bodies, no less than 91 per cent showed lesions of tuberculosis.

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[a] Bureau of Animal Industry Bulletin 99.

10. While the danger to which public health is exposed through the use of milk from tuberculous cows is of a magnitude almost beyond conception, it is unfortunately only one among many dangers to which persons are exposed through the use of impure, infected, and dirty milk.

11. If the inclination of the general public does not drive it to correct the evils to which it is exposed through the use of impure, infected, and dirty milk, it should bear in mind that common humanity imposes various sacred obligations, among which pure, wholesome milk for children ranks near to the first place. We have no right to shirk this obligation, and would have no inclination to shirk or ignore it if we took the time and trouble to investigate the number of deaths, especially among infants, directly due to contaminated milk. Most intelligent persons who read have some knowledge of the fact that numerous babies die from no other cause than the use of impure milk. Unfortunately the frequency with which milk from tuberculous cows causes tuberculosis is not so clearly apparent, because of the insidious, chronic character of the affection.

12. Our dairy herds can be cleaned of tuberculous cows by the proper application of the tuberculin test and the segregation of all reacting animals. After years of observation the tuberculin test has been found to be a more nearly infallible means for diagnosing tuberculosis than any we have for diagnosing other diseases of men and animals.

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